block from the set of data blocks at one corresponding frequency from the set of frequencies; and

selecting pairs of I and Q correlation values that correspond to calculated pairs of I and Q correlation integrals that are calculated at a frequency from the set of frequencies that is close to the target frequency to be selected pairs of I and Q correlation values;

selecting weights for each selected pair of I and Q correlation values, based on the difference of the target frequency from the frequency at which the selected pairs of I and Q correlation values are calculated, and also based on the position of the data block that corresponds to the selected pair of I and Q correlation values;

weighting the selected pairs of I and Q correlation values according to the selected weights to produce a set of weighted pairs of I and Q correlation values; and

summing the weighted pairs of I and Q correlation values.

20. (New) The method of Claim 19 wherein all of the data blocks comprising the set of data blocks have the same length.

21. (New) The method of Claim 20 wherein the length of the data blocks comprising the set of data blocks is chosen to minimize a measure of computational complexity.

22. (New) The method of Claim 19 wherein the set of data that is associated with the received signal comprises sampled data obtained by sampling the received signal.

23. (New) The method of Claim 22 wherein the received signal is a GPS signal.

A1

24. (New) The method of Claim 19 wherein the set of data that is associated with the received signal is an analog signal.

CONT

25. (New) The method of Claim 24 wherein the received signal is a GPS signal.

26. (New) The method of Claim 19 wherein the received signal is a GPS signal.

27. (New) The method of Claim 26 wherein calculating pairs of I and Q correlation integrals is performed coherently based on navigation bit information associated with a global positioning satellite vehicle.

28. (New) The method of Claim 26 wherein the target frequency is determined on the basis of an intermediate frequency employed by the receiver and a Doppler shift associated with a global positioning satellite vehicle.

29. (New) The method of Claim 19, wherein for each data block in the set of data blocks, the step of calculating the calculated pair of I and Q correlation integrals comprises calculating the calculated pair of I and Q correlation integrals for each hypothesized delay value over a range of hypothesized delay values.

30. (New) The method of Claim 29 wherein the received signal is a GPS signal.

31. (New) The method of Claim 19, wherein the number of data blocks is proportional to a length of the received signal.

A1

CONT

32. (New) The method of Claim 31 wherein the received signal is a GPS signal.

33. (New) A method for estimating a carrier frequency, the method comprising the computer-implemented steps of:

Step A: Defining R levels, indexed by consecutive integers 1 to R, wherein

each level r is associated with a set of data blocks that together make up a set of data that is associated with a received signal;

each data block in the set of data blocks associated with a level r, where r is greater than 1, is made up from data blocks from the set of data blocks associated with level r-1;

the set of data blocks associated with level R comprises a single data block

each level r is associated with a set of frequencies;

the set of frequencies associated with level R comprises a set of candidate frequencies;

Step B: for each data block in the set of data blocks associated with the first level, calculating at each frequency in the set of frequencies associated with the first level, a pair of I and Q integrals to produce corresponding pairs of I and Q correlation values;

Step C: selecting level 2 to be a current level and selecting level 1 to be a previous level;

A1

Step D0: selecting a data block in the set of data blocks associated with the current level that has not been previously selected to be a selected data block;

Step D1: selecting a set of constituent data blocks from the set of data blocks associated with the previous level that make up the selected data block to be a selected set of constituent data blocks;

CONT

Step D2: selecting a frequency from the set of frequencies associated with the current level to be a selected frequency;

Step D3: selecting pairs of I and Q correlation values corresponding to each data block in the selected set of constituent data blocks and corresponding to a frequency associated with the previous level which is close to the selected frequency, to be selected pairs of I and Q correlation values;

Step D4: selecting weights for each selected pair of I and Q correlation values, based on the difference of the target frequency from the frequency at which the selected pairs of I and Q correlation values are calculated, and also based on the position of the data block that corresponds to the selected pair of I and Q correlation values;

Step D5: weighting the selected pairs of I and Q correlation values according to the selected weights to produce a set of weighted pairs of I and Q correlation values corresponding to the selected data block and the selected frequency

Step D6: summing the weighted pairs of I and Q correlation values to produce a pair of I and Q correlation values associated with the current level, selected data block, and the selected frequency;

Step D7: repeating steps D2-D6 until every frequency from the set of frequencies associated with the current level has been selected to be the selected frequency;

Step D8: repeating steps D0-D7 until every data block in the set of data blocks associated with the current level has been selected to be the selected data block;

Step E: If the current level r is not level R, updating the current level to be level r+1, updating the previous level to be level r, and repeating steps D0-E; and

Step F: Estimating the carrier frequency on the basis of the pairs of I and Q correlation values associated with level R and with the frequencies in the set of candidate frequencies.

34. (New) The method of Claim 33 wherein Step F comprises the steps of:

Step F1: for each frequency in the set of candidate frequencies, calculating a magnitude associated with the corresponding pair of I and Q correlation values

Step F2: estimating a carrier frequency by selecting a frequency in the set of candidate frequencies for which the associated magnitude is largest.

35. (New) The method of Claim 34 wherein the received signal is a GPS signal.

36. (New) The method of Claim 34 wherein the maximum magnitude is compared against a threshold to determine whether the signal is acquired.

A1

37. (New) The method of Claim 36 wherein the received signal is a GPS signal.

CONT

38. (New) The method of Claim 33 wherein the set of data that is associated with the received signal comprises sampled data obtained by sampling the received signal.

39. (New) The method of Claim 38 wherein the received signal is a GPS signal.

40. (New) The method of Claim 33 wherein the set of data that is associated with the received signal is an analog signal.

41. (New) The method of Claim 40 wherein the received signal is a GPS signal.

42. (New) The method of Claim 33 wherein the received signal is a GPS signal.

43. (New) The method of Claim 42 wherein calculating pairs of I and Q correlation integrals is performed coherently based on navigation bit information associated with a global positioning satellite vehicle.

44. (New) The method of Claim 42 wherein the set of candidate frequencies is determined on the basis of an intermediate frequency employed by a receiver and a Doppler shift associated with a global positioning satellite vehicle.

A1 CONT

45. (New) The method of Claim 33, wherein the steps B-E are repeated for each hypothesized delay value over a range of hypothesized delay values, to produce a pair of I and Q correlation values corresponding to each candidate frequency and each hypothesized delay value.

46. (New) The method of Claim 45 wherein the received signal is a GPS signal.

47. (New) The method of Claim 45, wherein the step of estimating the carrier frequency comprises the steps of:

for each candidate frequency within the set of candidate frequencies and for each hypothesized delay in the range of hypothesized delay values, calculating a magnitude associated with the corresponding pair of I and Q correlation values; and selecting the hypothesized delay value and candidate frequency that has the highest magnitude calculation.

48. (New) The method of Claim 47 wherein the received signal is a GPS signal.

49. (New) The method of Claim 47 wherein the maximum magnitude is compared against a threshold to determine whether the signal is acquired.

50. (New) The method of Claim 49 wherein the received signal is a GPS signal.

A1

51. (New) The method of Claim 33, wherein the number R of levels equals 2.

CONT

52. (New) The method of Claim 51 wherein the received signal is a GPS signal.

53. (New) The method of Claim 33, wherein the number of data blocks in the set of data blocks associated with each level is proportional to a length of the received signal.

54. (New) The method of Claim 53 wherein the received signal is a GPS signal.

55. (New) The method of Claim 33, wherein every data in the set of data blocks associated with the same level has the same length.

56. (New) The method of Claim 55 wherein the received signal is a GPS signal.

57. (New) The method of Claim 55, wherein the number of frequencies in the set of frequencies associated with a level is proportional to the length of the data blocks associated with the level.

58. (New) The method of Claim 57 wherein the received signal is a GPS signal.

59. (New) A method for estimating a carrier frequency, the method comprising the computer-implemented steps of:

receiving data associated with a received signal;

A1

determining a frequency range of interest;

determining a set of coarse frequencies within the frequency range of interest;

CONT

determining a set of fine frequencies within the frequency range of interest;

dividing the data into a set of data blocks;

for each data block of the set of data blocks, calculating I and Q correlation values associated with the data at each frequency from the set of coarse frequencies;

for every frequency of the set of fine frequencies, determining a corresponding selected frequency in the set of coarse frequencies, wherein the selected frequency is close in value to the frequency in the set of fine frequencies;

for each data block of the set of data blocks selecting I and Q correlation values corresponding to each coarse frequency to be selected I and Q correlation values for the corresponding data block and coarse frequency;

selecting weights for the selected I and Q correlation values, based on the difference of a frequency in the set of fine frequencies to the corresponding selected frequency in the set of coarse frequencies, and also based on the position of the data block that corresponds to the selected pair of I and Q correlation values;

weighting the selected pairs of I and Q correlation values according to the selected weights to produce weighted pairs of I and Q correlation values;

computing an approximation to the I and Q correlation integrals over the entire data associated with the received signal, for each frequency in the set of fine frequencies, using the weighted pairs of I and Q correlation values; and

estimating the carrier frequency from within the set of fine frequencies by using the approximations to the I and Q correlation integrals at the frequencies in the set of fine frequencies.

A1 CONT

60. (New) The method of Claim 59 wherein all of the data blocks comprising the set of data blocks have the same length.

61. (New) The method of Claim 59 wherein the length of the data blocks comprising the set of data blocks is chosen to minimize a measure of computational complexity.

62. (New) The method of Claim 59 wherein the set of data that is associated with the received signal comprises sampled data obtained by sampling the received signal.

63. (New) The method of Claim 62 wherein the received signal is a GPS signal.

64. (New) The method of Claim 59 wherein the set of data that is associated with the received signal is an analog signal.

65. (New) The method of Claim 64 wherein the received signal is a GPS signal.

66. (New) The method of Claim 59 wherein the received signal is a GPS signal.

67. (New) The method of Claim 66 wherein calculating I and Q correlation values is performed coherently based on navigation bit information associated with a global positioning satellite vehicle.

A1 CONT

68. (New) The method of Claim 66 wherein the set of fine frequencies is determined on the basis of an intermediate frequency employed by the receiver and a Doppler shift associated with a global positioning satellite vehicle.

69. (New) The method of Claim 66 wherein the set of coarse frequencies is determined on the basis of an intermediate frequency employed by the receiver and a Doppler shift associated with a global positioning satellite vehicle.

70. (New) The method of Claim 59, wherein the number of data blocks in the set of data blocks is proportional to a length of the received signal.

71. (New) The method of Claim 70 wherein the received signal is a GPS signal.

72. (New) The method of Claim 60, wherein the number of coarse frequencies is proportional to the length of the data blocks.

73. (New) The method of Claim 72 wherein the received signal is a GPS signal.

74. (New) The method of Claim 59, wherein the number of fine frequencies is proportional to the length of the data associated with the received signal.

A1

75. (New) The method of Claim 74 wherein the received signal is a GPS signal.

CONT

76. (New) The method of Claim 59, wherein the step of computing the approximation to the I and Q correlation integrals comprises the steps of:

Step A: zero-padding the sequence of weighted pairs of I and Q correlation values; and

Step B: applying a Fast Fourier Transform on the zero-padded sequence; and

Step C: selecting the values of the transform at appropriate frequencies to be the approximations to the I and Q correlation integrals at the frequencies in the set of fine frequencies.

77. (New) The method of Claim 76 wherein the received signal is a GPS signal.

78. (New) The method of Claim 76 wherein the number of zeros introduced during the zero-padding Step A is determined by a frequency resolution associated with the set of fine frequencies.

79. (New) The method of Claim 78 wherein the received signal is a GPS signal.

80. (New) The method of Claim 59, wherein for each data block in the set of data blocks, the step of calculating I and Q correlation values comprises calculating the I and Q correlation values for each hypothesized delay value over a range of hypothesized delay values.

A1

81. (New) The method of Claim 80 wherein the received signal is a GPS signal.

CONT

82. (New) The method of Claim 76, wherein the Steps A, B, and C are carried out for each hypothesized delay value over a range of hypothesized delay values.

83. (New) The method of Claim 84 wherein the received signal is a GPS signal.

84. (New) The method of Claim 82, wherein the step of estimating the carrier frequency from within the set of fine frequencies comprises the steps of:

calculating a magnitude of the approximations to the I and Q correlation integrals for each frequency within the set of fine frequencies and for each hypothesized delay;

selecting the hypothesized delay and carrier frequency that has the highest magnitude calculation.

85. (New) The method of Claim 84 wherein the received signal is a GPS signal.

86. (New) The method of Claim 84 wherein the maximum magnitude is compared against a threshold to determine whether the signal is acquired.

A1
CONT

87. (New) The method of Claim 86 wherein the received signal is a GPS signal.